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Abundance and Run Timing of Adult Salmon in Tanada Creek in the Wrangell-St. Elias National Park and Preserve

Annual Report No. FIS00-01-3

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ANNUAL REPORT SUMMARY PAGE

Title: Abundance and Run Timing of Adult Salmon in Tanada Creek in the Wrangell-St. Elias National Park and Preserve

Study Number: FIS00-01-3

Investigators/Affiliations: Eric R. Veach and Sandra Scotton Wrangell - St. Elias National Park and Preserve (WRST)

Management Regions: Cook Inlet/Gulf of Alaska

Information Type: Fish stock status and trends

Issues Addressed: Tanada Creek salmon are highly susceptible to both Federal and state subsistence users as well as commercial harvest. As the northern most sockeye run of significant size in the Copper River, the Tanada creek stocks can provide an index of the overall sockeye salmon escapement of the Copper River. Monitoring of the variations in abundance and run timing as well as evaluating historical aerial surveys and commercial and subsistence harvest data provides information which can be used as a tool to develop a management plan for natural and healthy populations of Tanada Creek sockeye as mandated by the Alaskan National Interest Lands Conservation Act (ANILCA). The dynamic nature of the flows in Tanada Creek has prevented a rigid picket weir from functioning successfully. A floating resistance board weir and video escapement tower are to be tested for functionality on Tanada Creek.

Study Cost: **$**138,000

Study Duration: May 2000 to September 2002

Key Words: Batzulnetas, Copper River, Sockeye, Tanada Creek, Tanada Lake Stock/status and Trends, Use

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INTRODUCTION

The Upper Copper River drainage provides spawning habitat for sockeye *Oncorhynchus nerka,* chinook *O. tshawytscha* and coho *O. kisutch* salmon. Significant numbers of adult salmon are harvested in commercial drift gillnet operations near the mouth of the Copper River from mid-May to September. Salmon escapement into the Upper Copper River system contributes to Federal and state subsistence fishing through September 30. The monitoring and evaluation of these runs is essential to ensure that Wrangell - St. Elias National Park and Preserve (WRST) maintains natural and healthy populations as required by the Alaska National Interest Lands Conservation Act (ANILCA).

The Copper River system supports over 124 known stocks of sockeye salmon of which at least 12 occur above the confluence of the Copper and Slana Rivers (Roberson 1987). Two of these stocks migrate through Tanada Creek and spawn along the shores of Tanada Lake or in the lake outlet (Figure 1). Chinook salmon are believed to be present in incidental numbers in Tanada Creek (Raeder 1997, Raeder and others 1998).

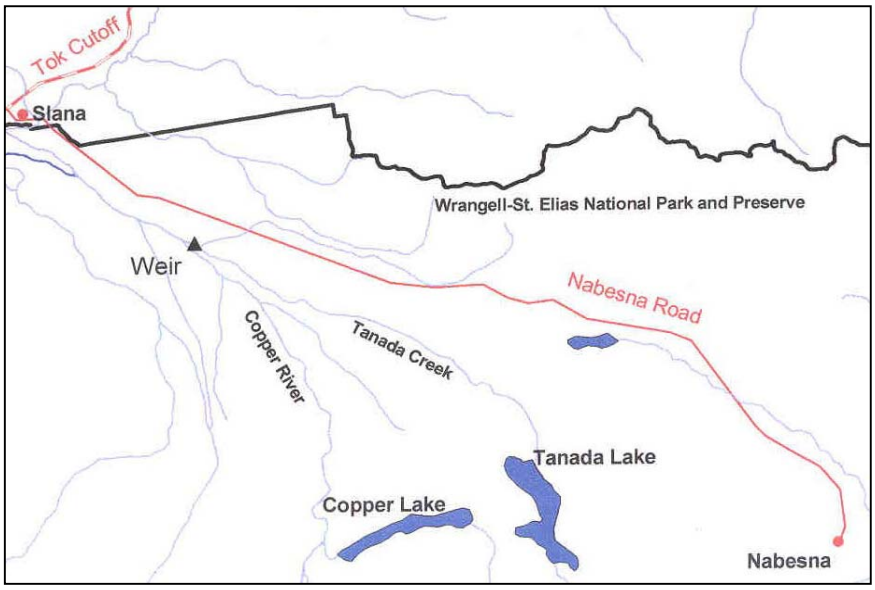

Figure 1. Tanada Creek and Vicinity

Structural failure of the panels occurred as a result of high water flows on the three weirs run by WRST in 1997, 1998, and 2000. In response to the dynamic flows of Tanada Creek, a floating resistance board weir was installed. The weir was operational beginning June 5, 2001. The first salmon arrived at the weir June 14, 2001. Counts continued until the run declined to three fish per week during the week of August 16, 2001. A total of 1,649 sockeye and 16 chinook were enumerated. In addition to the floating weir, a video escapement recorder was erected 20 m downstream of the weir. Operating the video tower in conjunction with the weir for two years will provide an opportunity to assess the reliability and accuracy of the video tower system.

Aerial survey counts of sockeye salmon have been conducted on Tanada Lake beginning in 1962 (Table 1). These escapement estimates are highly variable and provide an index of relative run strength from year to year (Wiswar 1997). Aerial counts on Tanada Lake and weir counts on Tanada Creek conducted by Alaska Department of Fish and Game (ADF&G) in 1975, 1978 and 1979 did not establish a reliable correlation for determining stock levels in a given year. Daily and total counts for salmon at the ADF&G weir site are listed in Appendix A. Wrangell - St. Elias National Park and Preserve (WRST) conducted aerial surveys of Tanada Lake in 1997, 1998, and 2000 (Raeder 1997a, Raeder and Rood 1998, Veach 2000) in conjunction with a weir. Appendix B contains the counts for the WRST weir in 1997, 1998, and 2000.

Table 1 – Aerial Survey Counts for Tanada Creek 1962-2001

Year	Weir	Aerial	Year	Weir	Aerial	Year	Weir	Aerial
1962	—	1500	***1975***	128	700	***1988***	—	3825
1963	—	1060	***1976***	—	2200	***1989***	—	3300
1964	—	1500	***1977***	—	2800	***1990***	—	3000
1965	—	3300	***1978***	2265	2625	***1991***	—	3050
1966	—	10	***1979***	10244	5225	***1992***	—	3450
1967	—	1	***1980***	—	13700	***1993***	—	—
1968	—	150	***1981***	—	11200	***1994***	—	—
1969	—	6	***1982***	—	11680	***1995***	—	—
1970	—	1000	***1983***	—	10900	***1996***	—	—
1971	—	3843	***1984***	—	16100	***1997***	27521	7875
1972	—	480	***1985***	—	11700	***1998***	28992	4470
1973	—	10	***1986***	—	8260	***2000***	—	4500
1974	—	2800	***1987***	—	8350	***2001***	1660	400

OBJECTIVES

Specific objectives for FY2001 for this study are:

1. acquire data addressing annual variation of abundance of salmon populations in Tanada Creek;
2. determine the variation of timing of salmon runs in Tanada Creek;
3. provide a relative index of abundance using aerial observations and assess that index against actual weir counts;
4. provide a hands-on educational opportunity for local students to learn about the Tanada Creek salmon run and how it is managed; and
5. determine the functionality of the video escapement recorder system as a long term method of estimating salmon escapement in Tanada Creek.

METHODS

Study Area

Watershed Description

Tanada Creek is a third order perennial stream and a tributary to the Upper Copper River in southeast interior Alaska. The stream flows through the Copper River Plateau and encompasses a watershed area of approximately 550 km^2. Originating at Tanada Lake (62°27'N, 143°23'W), Tanada Creek runs 30 km northwest to its confluence with the Copper River (62°37'N, 143°48'W). The terrain is nearly level to gently rolling throughout the creek basin and the stream gradient is less than 2%. The vegetation is dominated by mosses, sedges, dwarf birch and willows. Black and white spruce are the primary evergreens, with stands of cottonwoods interspersed. The soils are poorly drained and are underlain by shallow permafrost (USDA 1979).
Annual precipitation in the area averages 39 cm and ambient temperature ranges from a high of 32° C to a low of - 46° C. Average annual temperature is - 2.5° C (NOAA 1995). Breakup normally occurs in May, and water bodies freeze in September or October.

Weir Site Description

The weir site was located 920 m upstream from the Copper River and approximately 160 m downstream from the Batzulnetas village site (Figure 2). The site falls on private property of Katy John, an Athabaskan elder of Mentasta Lake. Access through private inholdings was obtained from the Mentasta Village Council and private landholders.

Stream width is about 9 m. The vertical banks are approximately 0.7 to 1.0 m high and bank undercutting ranges between 0 to .5 m. Maximum water depth at midstream during bank-full conditions is estimated at 1.2 m. Channel substrate is predominately cobble, with interstitial sand and gravel. The stream banks are stabilized by spruce, willow, alder and an under story of moss and horsetail ferns. Spruce and cottonwoods contribute to stream shading. A beaver dam is located 350 m below the weir site and acts as a partial migration barrier to adult salmon during periods of low flow. The beaver pond provides a resting area for migrating salmon.

A permanent cross section was established on June 9, 1998 about 10 m upstream of the weir. Four brass cap reference markers were set along the transect. A staff-gage was placed in the stream near the north bank intersecting the cross section.

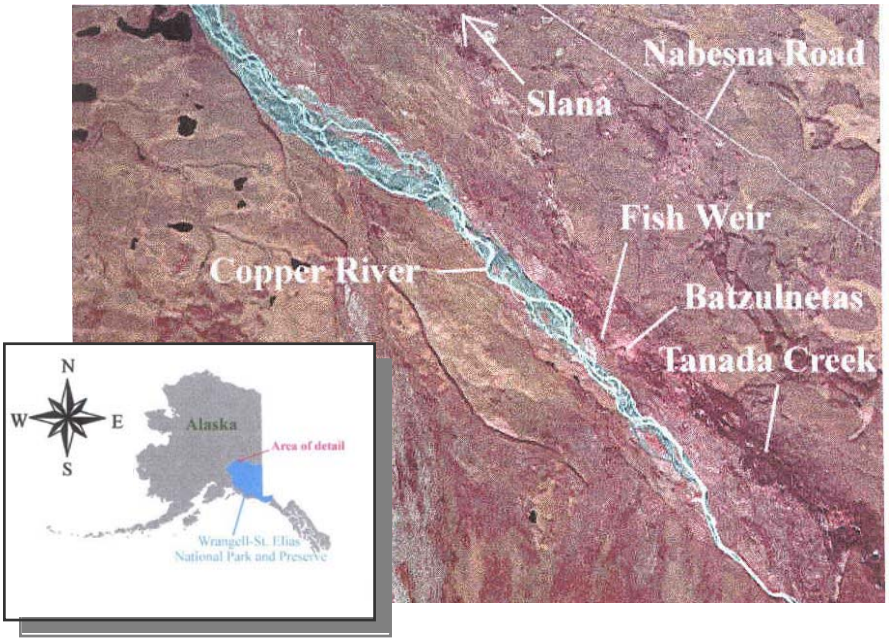

Figure 2 Location of Tanada Creek Fish Weir, 2001

Weir Installation and Operation

The floating resistance board weir was installed as described by Tobin (1994). The weir with picket spacing of 3.75 cm was placed at the end of a straight 120 m section of stream with moderate water velocity and laminar flow. When resistance boards were in the "up" position the downstream end of the weir lay flat on the waters surface. When resistance boards were in the "down position", the downstream end of the weir was raised approximately 75 cm above the surface of the water (Figure 3). A box, 1 m x 3 m, was constructed of 2x4 lumber, aluminum channel and hardware cloth. Gates that could be raised and lowered were installed at either end to allow for holding, sampling, and releasing fish. The box was place on the north bank side of the weir. The weir was operational on June 5, 2001. Two shifts monitored the weir for fish passage from June 5 to August 22. Shifts ran from 10 am – 7 pm and 11 pm – 7 am. A staff gauge and water temperature reading was taken at the beginning of each shift. Gates on the box were closed when the weir was not monitored.

A *HOBO® TEMP* data logger was placed in a submersible case at the base of the staff gauge to collect water temperature data throughout the summer. Water temperatures were also measured daily from a thermometer hanging on the outside of the sampling box.

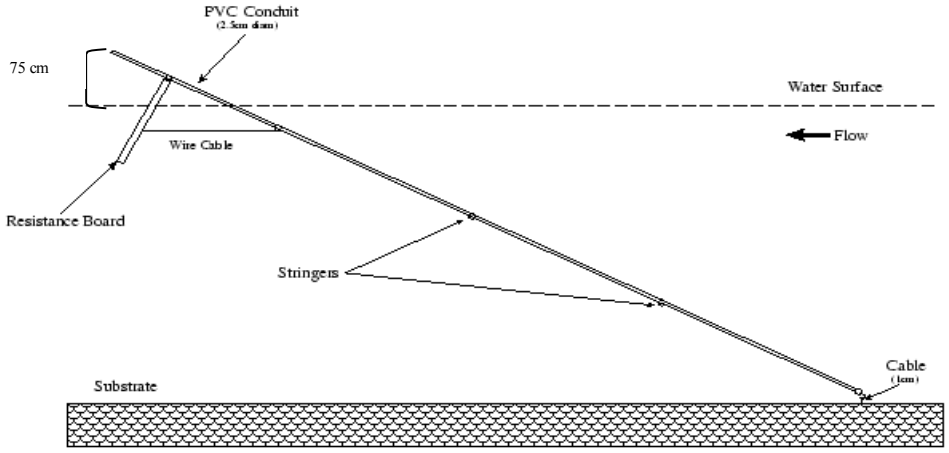

Figure 3. Placement of resistance boards in "down" position

Biological Data

Sockeye and chinook salmon were sampled for scales and sexed using external characteristics. Two measurements were taken on each fish, from mid-eye to fork length (MEF) and mid-eye to posterior insertion of anal fin (anal). Lengths were recorded to the nearest millimeter. A tagging cradle was used to facilitate handling. Scales were collected from the preferred area, located on the left side of the fish and two rows above the lateral line on a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin, according to Alaska Department of Fish and Game sampling protocol. One scale was taken from each sockeye salmon and three scales were taken for each chinook. Due to the low number of salmon passing through the weir, sampling occurred daily for sockeye and chinook to ensure the desired sample size was obtained.

Otiliths and anal lengths were collected from 62 sockeye carcasses in mid September for the purpose of comparing age class information with that obtained from scale samples. Scales and otiliths were sent to ADF&G Commercial Fisheries Management Division in Cordova, Alaska for processing.

Video Escapement Operation

On August 14, 2001, a video escapement recorder was installed 15 m downstream from the weir. A 1.5 in diameter pipe 15 m long was affixed horizontally between two spruce trees on either side of the creek. A 3 mm cable was attached to the trees above the pipe and was looped through guides along the pipe to provide extra support. Two remote cameras, sealed in waterproof housings were suspended from the pipe above the water surface approximately 5.5 m. The cameras were equipped with a 3.5 mm ultra-wide angle lens to allow for field of view up to 4 m. A waterproof case containing a time-lapse frame recording system and multilplexer unit was housed on the north bank of the creek. Two 12-volt deep cycle batteries provided power to the system. An immersible water turbine served to provided power to the system and keep the

batteries charged. A high contrast substrate panel was fixed to the streambed below the overhead cameras (Oatis and Dickson 2001). A row of pickets 2 m long was placed in the streambed perpendicular to the panel. The pickets, which bisected the creek at approximately 4.8 m from each bank, served two purposes; (1) to delineate the midstream field of view of the two cameras, providing a defined edge for the mid stream frame of the video; (2) to prevent salmon from moving between one camera view and the other while swimming upstream.

The time-lapse recorder was programmed to capture one image every .14 seconds allowing for up to 64 hours of video to be collected on a single T-160 tape. Tapes were changed every 48 hours. A viewing station was set up at the local ranger station in Slana to review the tapes.

RESULTS

Weir Operation

The weir was operated from June 5-August 22, 2001. High water and heavy debris flows submerged the weir and interrupted counting for approximately 10 days between July 25 and August 4. Two depth readings were recorded daily, an average was calculated when different depths were recorded in a 24-hour period. Water depth at the staff gauge ranged from 40 cm to >120 cm, with a mean depth of 67.8 cm. According to the NOAA weather service station located in Slana, 4.5 cm of rain fell between July 20-July 29. Tanada Creek was at flood stage, water depth was >120 cm from July 25-August 4, at which point the weir was completely submerged and water up to 15 inches deep channeled through the wooded area on the north bank of the creek. The weir sustained only minor damage. A large amount of sediment entered the creek as culverts upstream failed. This event significantly reduced water clarity therefore no fish could be observed passing through or over the weir.

Recorded water temperatures during weir operations ranged from 12°C to 20°C. The coolest temperature was recorded on June 20, and the warmest temperature was recorded during the day on July 21. The *HOBO® TEMP* data logger that was placed at the base of the staff gauge was dislodged during the flood event and lost, therefore no data was recovered.

On June 28, 2001, WRST was invited to present at the Batzulnetas culture camp held at the village site on Tanada Creek. Two educational programs were offered that provided an opportunity for local students to learn about the Tanada Creek salmon run, the weir, fisheries management and the lifecycle of sockeye. Twenty-five students participated in the salmon activitites. The weir was staffed by five local residents of Slana, a community located approximately 16 km northwest of the weir site.

Biological Data

Total sockeye *Oncorhynchus nerka* escapement between June 5-August 22 was 1,649 salmon. A total of 307 sockeye were sampled for length and sex information. Females comprised 49.5 % of

the sample (Table 2). Three sockeye mortalities occurred at the weir. In each case, the salmon died as a result of becoming lodged between pickets. No chinook mortalities occurred.

Table 2. Summary of length and sex information of sampled salmon

	Avg. length MEF mm	Range	n =	sd =	Avg. length anal mm	Range	n =	sd =
sockeye								
females	518	500 - 690	152	29	451	300 - 560	151	31
males	609	530 - 690	155	30	472	340 - 580	153	33
chinook								
females	830	810 - 850	2	28	641	630 - 652	2	16
males	780	730 - 930	4	100	601	560 - 702	4	70

A total of 16 chinook *O. tshawytscha* were counted between June 25 - July 11 (Figure 4). Six chinook were sampled for length and sex information. Chinook were observed below the weir on June 23, and the first passed through the box on June 25. A group of three chinook were observed below the weir on July 11, but were never observed passing through the box.

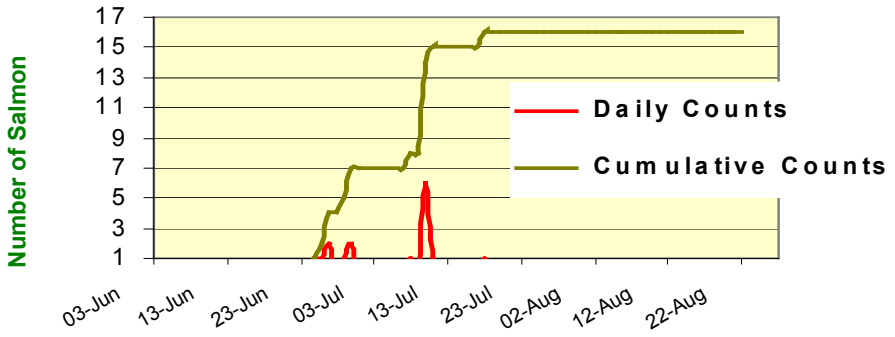

Figure 4. Daily and Cumulative Counts of Chinook escapement to Tanada Creek

The largest number of salmon migrated through the weir between June 23 and July 25 (Figure 5). The highest number of salmon counted in one day was 305 on July 2. On July 19, 258 sockeye migrated through the weir. All other counts were < 100/day. The most sockeye counted in one hour was 160 on July 2 between 2400-0100 hours. Movement of sockeye occurred predominately at night with 73% of the fish counted between 2300-0400 hours.

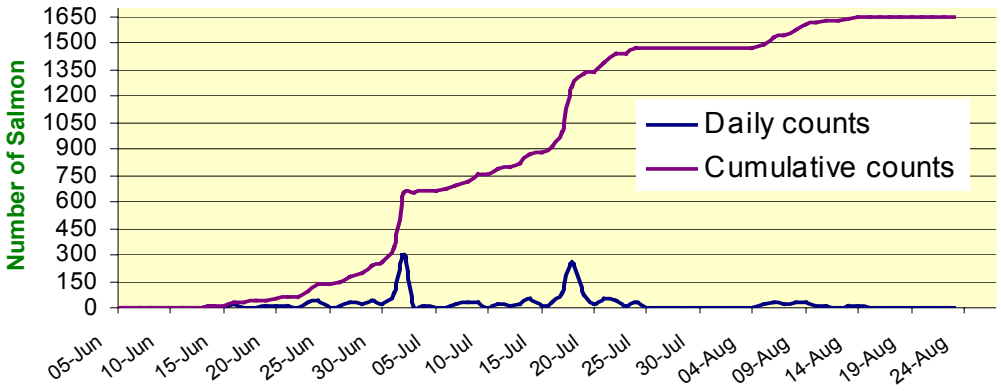

Figure 5. Cumulative and daily counts of sockeye escapement to Tanada Creek

Aerial surveys were conducted by the National Park Service on the Slana River and Mentasta Lake area on July 12, over 8,000 sockeye were observed. ADF&G conducted aerial surveys of the same area on August 13 and observed over 22,000 sockeye. Aerial surveys of Tanada Lake and the Tanada Lake outlet by ADF&G August 26, 2001 observed 200 sockeye in both the lake and the outlet for at total of 400 salmon.

Video Escapement Operation

The tower was erected and functioning near the end of the sockeye run. However, all of the salmon enumerated after August 14 passed through the weir during night hours. The lighting components which provide auxiliary illumination for night recording did not arrive until the end of August, and no visual data was collected that could be compared to weir counts. It took six minutes to review one hour of recorded tape. Groups of Arctic grayling (*Thymallus arcticus)* were observed on video. Carcasses removed from the weir panels were also observed on the video recordings.

DISCUSSION

Weir Operation

The floating resistance board weir outperformed the rigid picket weir that was used on Tanada Creek in 1997, 1998, and 2000. Although some damage occurred as a result of the flood, the weir was not dislodged and required only minimum maintenance.

Biological Data

The migration of sockeye and chinook on Tanada Creek began nine days after the weir was installed, no fish were observed migrating during the week the weir was installed, May 29-June 5. The first group of sockeye passed through the trap on June 14. Peak period of migration for sockeye this year could not be determined due to overall low daily counts (Figure 4). The median run day, when 50% of the total count has passed the weir, was calculated to be July 14, when at 1100 hours, 836 sockeye had been enumerated.

The Tanada Creek sockeye run appears to be variable (Appendix A). The 2001 weir and aerial counts of sockeye in Tanada Creek suggest this is likely one of the lowest runs recorded since 1962, despite the evidence of strong sockeye runs in other systems of the Upper Copper River. No aerial survey data was available for Tanada Lake and the outlet from 1996, which would have provided some indication as to the potential strength of 2001 return. The aerial survey count for 2001 on Tanada Creek is the third lowest recorded since 1962 (excluding any count $\leq$10).

Although there is no documentation of a chinook run in Tanada Creek, chinook salmon were believed to be present in incidental numbers. However, over twice as many chinook (16) were documented in Tanada Creek in 2001 than in any previous year (Raeder 1997, Raeder and others 1998). Two were also harvested in the fishwheel at the Batzulnetas Federal Subsistence Fishery in the Copper River just below the mouth of Tanada Creek. Prior to 2001, a total of 9 chinook (n=5 for 1975, 78 & 79 combined, n=2 for 1997, n=2 for 1998) were documented in the five years weirs were operated on the creek.

Age data has not been processed for the scale or otilith samples taken. An addendum to this report will be submitted with the age class information when it has been received and analyzed.

Post-season analysis of commercial harvest and escapement at Miles Lake indicated a good return of sockeye salmon throughout the Copper River Basin (ADF&G). Based on the 22-year average of 595,779 sockeye salmon, escapement in 2001 was about 40% higher than average. Aerial survey observations for 2001 by WRST and ADF&G suggest that the run of sockeye in the Slana drainage was strong (Table 3) . ADF&G observed 400 salmon in Tanada Lake and the outlet, this accounts for an estimated 24% or the weir count. Aerial surveys of Tanada Lake in 1997 and 1998 have contributed to developing a correlation factor based on salmon counts at the weir. An aerial survey conducted August 19, 1998 observed 15% of the cumulative weir count. Applying the extrapolated weir count of about 38,000 salmon for 1997, the aerial estimate was 21% of the weir count (Raeder 1997, Raeder and others, 1998).

Table 3. Historical Aerial Survey Counts for Slana River-Mentasta Lake Region**

Year	Aerial count	Year	Aerial count	Year	Aerial count
1978	5,520	*1986*	9,250	***1994***	*
1979	3,635	*1987*	6,075	***1995***	*
1780	4,275	*1988*	78,50	***1996***	*
1981	37,250	*1989*	8,020	***1997***	*
1982	10,000	*1990*	13,100	***1998***	1,800
1983	12,050	*1991*	5,750	***2000***	2,119
1984	7,210	*1992*	1,145	***2001***	22,000
1985	7,045	*1993*	*		

*no data available

**Region includes: Mentasta Lake, Bad Crossing #1 & #2, Fish Creek, Bone Creek, Granite Creek, and Slana sloughs as identified and named by ADF&G.

Historically, local indigenous Alaskans harvested salmon with spears, weirs and woven dip nets. Fish wheels were introduced into the Copper Basin around 1910 (Reckord 1983). Euro-Americans began commercial fishing activities in the Gulf of Alaska near the mouth of the Copper River in 1889.

Contemporary, non-commercial salmon harvesting in the Upper Copper River District occurs primarily through subsistence fishing. Subsistence fishing in the Glennallen Subdistrict takes place along the mainstem of the Copper River from the Chitina-McCarthy bridge upstream to the Slana River, a distance of approximately 160 km. This fishery utilizes fish wheels to take

salmon, with dip nets as a secondary method. In the Chitina Subdistrict, located on the Copper River downstream from the Chitina-McCarthy bridge south to Haley Creek has primarily primary method of take is dipnets. The Batzulnetas subsistence fishery takes place at Batzulnetas, a historical Athabaskan village site located near the mouth of Tanada Creek and has been occupied by Upper Ahtna peoples for at least 1000 years (Kari 1986). A number of area residents who are descendants of earlier inhabitants still utilize its resources for cultural education purposes including subsistence fishing which utilizes spear, dipnet, rod and reel in the creek, and fishwheels at the mouth (Table 4). In the past, a relatively small number of sockeye are caught by sport fishing. However, since the late 1980's sport fish harvest of sockeye in the Copper River Basin has more that quadrupled, although limited effort has occurred on Tanada Creek and typically salmon migrating to Tanada Creek are not subjected to sport fishing pressure in the mainstem Copper River (Taube, 2001). Historical Copper River sockeye catch and escapement data is shown in Table 5.

Table 4 - Participation and harvest of Batzulnetas fishery, 1987 – 2001

Year	Permits Issued	Sockeye Harvest	Year	Permits Issued	Sockeye Harvet
1987	8	22	***1995***	4	16
1988	0	0	***1996***	0	0
1989	0	0	***1997***	1	428
1990	0	0	***1998***	3	582
1991	0	0	***1999***	1	55
1992	0	0	***2000***	0	0
1993	1	160	***2001***	1	62
1994	4	997			

Table 5 – Copper River Sockeye Salmon Catch and Escapement Data 1978-2001

Year	Commercial	Miles Lake	Subsistence		Sport	Upper Copper
	Catch	Sonar counts	Glennallen	Chitina	Catch	Escapement
1978	250,629	107,011	6,406	19,377	1,606	79,622
1979	75,762	237,173	18,795	14,301	1,599	202,478
1980	18,451	276,538	15,811	15,230	2,109	243,388
1981	489,915	535,263	30,545	34,623	1,523	468,572
1982	1,190,730	467,306	39,968	65,463	3,343	358,532
1983	610,023	545,724	37,596	73,198	2,619	432,311
1984	895,235	536,806	27,941	48,236	3,267	457,362
1985	952,965	436,313	30,666	30,885	4,752	370,010
1986	780,808	509,275	27,441	41,054	4,137	436,643
1987	1,181,285	483,478	33,106	43,492	4,876	402,004
1988	576,960	488,398	29,194	42,331	3,038	413,835
1989	1,025,923	607,797	28,360	55,778	4,509	519,150
1990	844,767	581,895	31,765	65,432	3,569	481,129
1991	1,206,811	579,435	39,599	77,590	5,511	456,735
1992	970,938	601,952	45,232	86,724	4,560	465,436
1993	1.395.371	797,902	53,252	93,472	5,288	645,890
1994	1,152,220	715,181	68,278	94,024	6,533	546,346
1995	1,271,822	599,265	52,516	79,006	6,068	461,675
1996	2,356,365	906,867	52,052	95,007	14,170	745,638
1997	2,955,431	1,148,079	82,807	148,727	12,807	903,738
1998	1,339,860	866,957	64,463	137,161	11,101	654,232
1999	1,682,559	848,921	77,369	141,658	11,184	618,710
2000	886,334	587,592	60,601	105,969	12,306	408,716

2001	1,321,028	833,569	Prelim.	Prelim.	Prelim.	Prelim.
Average	1,045,079	595,779	41,468	69,945	5,673	468,354

Groups of stocks with early mean arrival dates at Wood Canyon tended to spawn in the uppermost areas of the Copper River drainage (Merritt and Roberson 1986). This observation agrees with the principle that stocks which must migrate the the farthest to spawn tend to be the first ones in the river system (Thompson 1951). Commercial harvest of sockeye in the Copper River for 2001 was 1,321,028 (Table 5). Commercial fishing periods began on May 17. The commercial sockeye salmon fishery is essentially completed by the end of July, with most of the catch being taken between late May and mid June. Northern most upper Copper River stocks (Mentasta Lake, Slana River, Suslota Lake, Tanada Lake) compose most of the salmon harvested in the May commercial fishing periods (Merritt and Roberson 1986).

Table 6. Commercial Opener dates, duration and harvest for May 2001

Date	*Hours of opening*	*Harvest**
May 17	12	72,274
May 21	12	137,000
May 25	12	199,400
May 28	24	107,000
May 31	36 **	65,512

* preliminary harvest estimates
** fishing period extended 24 hours due to announcement from processors to limit participation in the commercial fishery.

During the educational program prepared for the participants of the Batzulnetas culture camp, WRST provided a forum for community members to observe the weir project in operation and ask questions about the abundance, timing and management of the Tanada Creek run. Five local residents of the Slana area were employed by WRST to staff the weir. Through this employment, they gained experience in monitoring, sampling, problem solving, and collecting, reporting and entering data.

Video Escapement Operation

The site selected for the video escapement recorder provides full coverage of the creek. The video components functioned well and recorded clear images of the creek. Due to the late installation, the tower was not able to collect any data that could be compared to weir counts. However, the equipment has been tested, recorded tapes have been reviewed, and modifications to the panel and the suspension structure have been noted to enhance installation for next season.

CONCLUSIONS

Weir Operation

A floating resistance board weir was an appropriate design for the dynamic Tanada Creek system. Although some days were lost to flooding, the weir remained in place, requiring only minimal maintenance to continue operating.

Biological Data

The 2001 weir counts for sockeye in Tanada Creek suggest this is one of the lowest runs observed since 1962 despite the appearance of strong sockeye runs in other systems of the upper Copper River.

The record low counts of 2001 on Tanada Creek could be contributed to several factors:
1. Natural variations in stocks;
2. Low escapement of sockeye returning to Tanada Lake in 1996;
3. Problems with passage (dry channels) for outmigrants in 1997 ;
4. Changes in the Tanada Lake system resulting in lower productivity;
5. Disproportionate harvest by commerial and subsistence fisheries downstream.

Video Escapement Operation

Comparing accuracy and reliability of the video escapement recorder counts with the weir counts did not occur. The equipment was installed and tapes were recorded. Determination of accuracy and reliability of the system will begin in 2002.

RECOMMENDATIONS

Biological Data

1. Incorporate limnology sampling of Tanada Lake with the objective of estimating lake productivity and obtaining a preliminary estimate spawning escapement.

2. Investigate smolt outmigration in Tanada Lake to determine outmigration timing, to collect biological information, and to apply coded wire tags to determine recovery rate of Tanada Creek sockeye in the commercial and subsistence fisheries of the Copper River.

3. Place a second *HOBO® TEMP* in the creek to ensure that a temperature data set is recorded.

4. Integrate fin clip collection into the sampling protocol to provide material for a genetic processing and DNA analysis to determine if there is a genetic difference between the two stocks (lake stock and outlet stock) of sockeye present in Tanada Creek.

5. Continue monitoring and collecting scale samples of chinook salmon.

Video Escapement Operation

1. Continue for at least two more years with the video escapement to establish if the counts from the video tapes are as reliable and accurate as the weir counts.

2. Dedicate a single staff person the reviewing the tapes for consistency and fluency.

Management

1. Continue this project with a goal of identifying an indicator that will serve to predict what escapement may be.

2. Continue monitoring to work towards defining what natural and healthy sockeye escapement is for Tanada Creek stocks.

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PERSONAL COMMUNICATIONS

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Appendix A- Tanada Creek weir daily sockeye and chinook escapement ADF&G, 1975, 1978 and 1979.

	Sockeye	Sockeye	Sockeye	Chinook
Date	***1975***	***1978***	***1979***	
6/22	-	0	-	-
6/23	-	0	-	-
6/24	-	0	-	-
6/25	-	0	7	0
6/26	-	0	104	0
6/27	-	0	452	0
6/28	2	0	8	0
6/29	0	0	68	0
6/30	0	0	24	0
7/1	0	0	16	0
7/2	0	0	130	0
7/3	1	0	558	0
7/4	0	0	40	0
7/5	2	0	15	0
7/6	0	0	55	0
7/7	77	0	404	0
7/8	37	306	201	1
7/9	8	377	310	0
7/10	0	1	575	0
7/11	0	116	424	0
7/12	1	0	52	1
7/13	0	3	881	0
7/14	0	0	1	0
7/15	0	0	0	0
7/16	0	1	126	0
7/17	0	0	63	0
7/18	0	0	53	1
7/19	0	0	189	0
7/20	0	0	232	0
7/21	0	0	74	0
7/22	0	0	574	1
7/23	0	0	284	0
7/24	0	0	199	0
7/25	0	0	118	0
7/26	0	0	86	0
7/27	-	0	374	0
7/28	-	1300[1]	55	0
7/29	-	0	337	1
7/30	-	0	295	0
7/31	-	21	22	0
8/1	-	41	155	0
8/2	-	1	509	0
8/3	-	6	147	0
8/4	-	2	269	0
8/5	-	0	138	0
8/6	-	8	110	0
8/7	-	16	27	0
8/8	-	0	99	0
8/9	-	1	183	0
8/10	-	0	211	0
8/11	-	0	209	0
8/12	-	0	312	0
8/13	-	3	38	0
8/14	-	60	4	0
8/15	-	-	17	0
8/16	-	-	144	0
8/17	-	-	1	0
8/18	-	-	229	0
8/19	-	-	35	0
8/20	-	-	0	0

8/21	-	-	1	0
Total	128	2265	10244	5

[1]Heavy rains for 2 days pulled section of weir - est. 1300 sockeye migrated through.

Appendix B – Tanada Creek sockeye salmon escapement NPS -1997, 1998 and 2001.

	1997		1998		2001			1997		1998		2001	
Date	Daily	Cum	Daily	Cum	Daily	Cum	Date	Daily	Cum	Daily	Cum	Daily	Cum
6/2	-	-	0	0	-	-	7/13	997*	23184	6831	6831	23	816
6/3	-	-	0	0	-	-	7/14	852	24036	1095	7926	55	871
6/4	-	-	0	0	-	-	7/15	1142	25178	1246	9172	9	880
6/5	-	-	0	0	0	0	7/16	1054	26232	702	9874	36	916
6/6	-	-	0	0	0	0	7/17	801	27033	2188*	12062	78	994
6/7	-	-	0	0	0	0	7/18	488	27521	507	12569	258	1252
6/8	-	-	0	0	0	0	7/19	-	-	1956	14525	73	1325
6/9	-	-	0	0	0	0	7/20	-	-	1138	15663	17	1342
6/10	-	-	0	0	0	0	7/21	-	-	616	16279	52	1394
6/11	-	-	0	0	0	0	7/22	-	-	443	16722	43	1437
6/12	-	-	0	0	0	0	7/23	-	-	460	17182	9	1446
6/13	-	-	0	0	0	0	7/24	-	-	291	17473	29	1475
6/14	-	-	0	0	11	11	7/25	-	-	895	18368	*	1475
6/15	-	-	0	0	1	12	7/26	-	-	190	18558	*	1475
6/16	-	-	0	0	19	31	7/27	-	-	887	19445	*	1475
6/17	-	-	0	0	2	33	7/28	-	-	427	19872	*	1475
6/18	-	-	0	0	5	38	7/29	-	-	1019	20891	*	1475
6/19	-	-	0	0	8	46	7/30	-	-	1262	22153	*	1475
6/20	-	-	0	0	6	52	7/31	-	-	1008	23161	*	1475
6/21	-	-	0	0	11	63	8/1	-	-	703	23864	*	1475
6/22	-	-	0	0	3	66	8/2	-	-	21	23885	*	1475
6/23	1134	1134	0	0	29	95	8/3	-	-	1058	24943	*	1475
6/24	686	1820	0	0	38	133	8/4	-	-	429	25372	*	1475
6/25	730	2550	0	0	0	133	8/5	-	-	597	25969	19	1494
6/26	1692	5882	0	0	10	143	8/6	-	-	409	26378	35	1529
6/27	1640	5882	0	0	29	172	8/7	-	-	578	26956	16	1545
6/28	1666**	7548	0	0	22	194	8/8	-	-	1	26957	28	1573
6/29	769**	8317	0	0	44	238	8/9	-	-	260	27217	36	1609
6/30	694	9011	0	0	23	261	8/10	-	-	392	27609	8	1617
7/1	844	9855	0	0	84	345	8/11	-	-	448	28057	9	1626
7/2	1615	11470	0	0	305	650	8/12	-	-	276	28333	5	1631
7/3	1099	12569	0	0	3	653	8/13	-	-	397	28730	9	1640
7/4	1585	14154	0	0	15	668	8/14	-	-	93	28823	6	1646
7/5	1342**	15496	0	0	0	668	8/15	-	-	3	28826	1	1647
7/6	1582**	17078	0	0	4	672	8/16	-	-	161	28987	0	1647
7/7	2145	19223	0	0	20	692	8/17	-	-	2	28989	0	1647
7/8	1018	20241	0	0	27	719	8/18	-	-	0	28989	0	1647
7/9	638	20879	0	0	36	755	8/19	-	-	2	28991	*	1647
7/10	572	21451	0	0	5	760	8/20	-	-	1	28992	*	1647
7/11	300	21751	0	0	23	783	8/21	-	-	0	28992	0	1647
7/12	436*	22187	0	0	10	793	8/22	-	-	-	-	2	1649
							8/23	-	-	-	-	0	1649
							Total	27521	27521	28992	28992	1649	1649

*no data
**Interpolated value

Appendix C. Daily and Cumulative counts for chinook salmon on Tanada Creek 2001

Date	Daily	Cum	Date	Daily	Cum
6/5	0	0	7/13	0	15
6/6	0	0	7/14	0	15
6/7	0	0	7/15	0	15
6/8	0	0	7/16	0	15
6/9	0	0	7/17	0	15
6/10	0	0	7/18	1	16
6/11	0	0	7/19	0	16
6/12	0	0	7/20	0	16
6/13	0	0	7/21	0	16
6/14	0	0	7/22	0	16
6/15	0	0	7/23	0	16
6/16	0	0	7/24	0	16
6/17	0	0	7/25	0	16
6/18	0	0	7/26	0	16
6/19	0	0	7/27	0	16
6/20	0	0	7/28	0	16
6/21	0	0	7/29	0	16
6/22	0	0	7/30	0	16
6/23	0	0	7/31	0	16
6/24	0	0	8/1	0	16
6/25	1	1	8/2	0	16
6/26	1	2	8/3	0	16
6/27	2	4	8/4	0	16
6/28	0	4	8/5	0	16
6/29	1	5	8/6	0	16
6/30	2	7	8/7	0	16
7/1	0	7	8/8	0	16
7/2	0	7	8/9	0	16
7/3	0	7	8/10	0	16
7/4	0	7	8/11	0	16
7/5	0	7	8/12	0	16
7/6	0	7	8/13	0	16
7/7	0	7	8/14	0	16
7/8	1	8	8/15	0	16
7/9	0	8	8/16	0	16
7/10	6	14	8/17	0	16
7/11	1	15	8/18	0	16
7/12	0	15	8/19	0	16
			8/20	0	16